What is claimed is:

1. A platform for use in sample analysis comprising an optically transparent substrate having a refractive index (n_1), a thin, optically transparent layer, formed on one surface of the substrate, said layer having a refractive index (n_2) which is greater than (n_1), said platform incorporating therein one or multiple corrugated structures comprising periodic grooves which define one or multiple sensing areas or regions, each for one or multiple capture elements, said grooves being so profiled, dimensioned and oriented that either

a) coherent light incident on said platform is diffracted into individual beams or diffraction orders which interfere resulting in reduction of the transmitted beam and an abnormal high reflection of the incident light thereby generating an enhanced evanescent field at the surface of the one or multiple sensing areas; or

b) coherent and linearly polarised light incident on said platform is diffracted into individual beams or diffraction orders which interfere resulting in almost total extinction of the transmitted beam and an abnormal high reflection of the incident light thereby generating an enhanced evanescent field at the surface of the one or multiple sensing areas.

2. A platform comprising an optically transparent substrate having a refractive index (n1), a thin, optically transparent layer, formed on one surface of the substrate, said layer having a refractive index (n2) which is greater than (n1), said platform incorporating in the transparent layer a corrugated structure substantially over the entire platform, or multiple separate corrugated structures arranged on the platform, said structures comprising substantially parallel periodic grooves which are mono- or multi-diffractional which grooves represent one or multiple sensing areas or regions, wherein

(a) the depth of the grooves is in the range of 3 nm to the thickness of the optically transparent layer,

(b) the thickness of the optically transparent layer is in the range of 30 to 1000 nm,

(c) the period of the corrugated structure is in the range of 200 to 1000 nm,

(d) the ratio of groove depth to the thickness of the optically transparent layer is in the range of 0.02 to 1, and

(e) the ratio of groove width to the period of the grooves is in the range of 0.2 to 0.8.

3. A platform as claimed in claim 2, the arrangement being such that, in use, the grooves are so profiled, dimensioned and oriented that either

a) coherent light incident on the platform is diffracted into individual beams or diffraction orders which interfere resulting in reduction of the transmitted beam and an abnormal high reflection of the incident light thereby generating an enhanced evanescent field at the surface of the one or multiple sensing areas; or

b) coherent and linearly polarised light incident on said platform is diffracted into individual beams or diffraction orders which interfere resulting in almost total extinction of the transmitted beam and an abnormal high reflection of the incident light thereby generating an enhanced evanescent field at the surface of the one or multiple sensing areas.

4. A platform according to claim 1 wherein the substrate of the platform is formed from inorganic material.

5. A platform according to claim 1, wherein the substrate is formed from organic material.

6. A platform according to claim 1, wherein the optically transparent layer is formed from inorganic material.

7. A platform according to claim 1, wherein the optically transparent layer is formed from organic material.

8. A platform according to claim 1, wherein the depth of the diffraction grooves is in the

range 3 nm to the thickness of the optically transparent layer, preferably 10 nm to the thickness of the optically transparent layer.

9. A platform according to claim 8, wherein the thickness of the optically transparent layer is in the range 30 to 1000 nm, the period of the diffraction grooves is in the range 200 to 1000 nm, the ratio of the groove depth to the thickness of the optically transparent layer lies in the range 0.02 to 1 and the ratio of the grooves width to the period of the grooves lies in the range 0.2 to 0.8 resulting in an extremely short propagation distance.

10. A platform according to claim 1, wherein the surface of the optically transparent layer includes one or a plurality of sensing areas, the or each of which carries one or plurality of capture elements.

11. A platform according to claim 10, wherein each capture element contains individual and/or mixtures of capture molecules which are capable of affinity reactions.

12. A platform according to claim 10, including an adhesion promoting layer disposed at the surface of the optically transparent layer in order to enable immobilisation of capture molecules.

13. A platform according to claim 1, wherein the platform is formed with a plurality of sensing areas or regions, each having its own diffractive grooves or multiple, superimposed grooves suitable for multicolor excitation and detection of samples.

14. Apparatus for analysing samples comprising a platform according to claim 1, wherein means for generating a light beam and for directing the beam so that it is incident upon the platform at an angle which causes evanescent resonance to occur in the platform to thereby create an enhanced resonant field in the sensing area of the platform, and means for detecting a

characteristic of a material disposed on or in the vicinity of the sensing area of the platform.

15. Apparatus according to claim 14, wherein the light generating means comprises a laser for emitting a coherent laser beam.

16. Apparatus according to claim 15, including optical elements for directing the laser beam so that it is incident on the platform at an angle θ, the angle θ being defined by the expression $\sin\theta = n - \lambda/\Lambda$ where Λ is a period of the diffractive grooves, λ is the wavelength of the light and n is the effective refractive index of the optically transmitting layer.

17. Apparatus according to claim 14, wherein the detecting means is arranged to detect luminescence such as fluorescence, phosphorescence, chemi-luminescence, and electro-luminescence.

18. Apparatus according to claim 14 wherein the light generating means is adapted to generate light having a linear polarisation component which gives rise to TM excitation.

19. A process for analysing a sample or samples which comprises bringing the sample into contact with the sensing area of a platform according to claim 1, irradiating the platform with a light beam such that evanescent resonance is caused to occur within the sensing area of the platform and detecting radiation emanating from the sensing area.

20. A method according to claim 19, including adding fluorescent inducing material to the samples under investigation and sensing fluorescence induced in said samples by excitation of the samples by the enhanced evanescent field.

21. A process according to claim 20 wherein the fluorescent inducing material comprises a luminescent marker.

22. A process according to claim 21, wherein the luminescent marker comprises luminescent compound or compounds having luminescence in the range of from 400 nm to 1200 nm which are functionalised or modified in order to be attached to one or more of the affinity partners, including derivatives of one or more of the following:

polyphenyl and heteroaromatic compounds

stilbenes,

coumarines,

xanthene dyes,

methine dyes,

oxazine dyes,

rhodamines,

fluoresceines,

coumarines, stilbenes,

pyrenes, perylenes,

cyanines, oxacyanines, phthalocyanines, porphyrines, naphthalopcyanines, azobenzene derivatives, distyryl biphenyls,

transition metal complexes e.g. polypyridyl/ruthenium complexes, tris(2,2'-bipyridyl)ruthenium chloride, tris(1,10-phenanthroline)ruthenium chloride, tris(4,7-diphenyl-1,10-phenanthroline) ruthenium chloride and polypyridyl/phenazine/ruthenium complexes, such as octaethyl-platinum-porphyrin, Europium and Terbium complexes

quantum dot particles/beads or derivatives thereof.

23. A process as claimed in claim 19 wherein the light beam is configured so as to give rise to TM excitation.

24. A process according to claim 19 wherein the light beam is incident onto the substrate side of the platform.

25. A process according to claim 19 wherein the light beam is incident onto the corrugated high refractive index side of the platform.

26. A platform for use in sample analysis, said platform having one or more sensing areas or regions, each for receiving a capture element or elements which when the platform is irradiated with coherent light can interact to provide an indication of an affinity reaction, wherein each capture element includes two or more types of capture molecule.

27. A process according to claim 23 wherein the light beam is incident onto the substrate side of the platform.

28. A process according to claim 23 wherein the light beam is incident onto the corrugated high refractive index side of the platform.

29. Apparatus according to claim 15 wherein the light generating means is adapted to generate light having a linear polarisation component which gives rise to TM excitation.